In vitro studies of two drought tolerant bryophytes

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ABSTRACT

Bryophytes constitute a group of non-vascular plants that include mosses, liverworts and hornworts. Our research group has initiated the search and study of Mexican bryophyte species that have high levels of drought tolerance. Mature gametophytes and sporophytes of the moss *Ceratodom stenocarpus* and the hepatic *Targionia hypophylla* were collected before the rainy season at a Juniperus forest localized in Tlaxcala state. Phenotypic analyses under water-deficit conditions showed that these species can withstand a total loss of water content from their cell protoplasm, but they can also rehydrate rapidly after watering. Thus, the selected bryophytes present clear characteristics of the resurrection phenomenon (desiccation tolerance). Spores obtained from superficially disinfected sporophytes were used to perform germination *in vitro* assays in the presence and absence of salt (NaCl) and osmotic agents at different concentrations. To investigate the effect of salt and osmotic stress on adult stages, we focused experiments on transferring mature tissues to stressing plates. The obtained results showed that both studied species are osmotic stress tolerant but salt sensitive plants at both germination and mature stages of development.

INTRODUCTION

Water deficit in the environment constitutes a very stressful condition in plants (Ingram and Bartels, 1996; Bohnert 2000). The global climatic change has triggered many changes in temperature and rainfall levels, which has had an impact on agriculture performance, especially in recent years. These factors have caused the loss of farmlands, affecting the economy, society and food. This problem demands the design of stable and reproducible biotechnological strategies to generate agronomic crops resistant to such climate change. Traditional genetic approaches had no had enough impact to contend with this issue, and the need to look into the genomes of non-model plants emerges stronger constantly (Halford, 2006).

In nature there are some plant species that have developed molecular and physiological mechanisms to tolerate biotic and abiotic stresses that co-exist in the environment. It is clear that terrestrial land plants live in a “water-limiting environment”. Compared to protists, fungi, and animals, specialized desiccation tolerant structures are both common and widely distributed in land plants. The production of seeds, pollen and spores capable of surviving in water free environment is a remarkable aspect in the plant life cycle. However, although phylogenetically well distributed (with the exception of the gymnosperms), just a few plant species are able to tolerate extreme desiccation at the vegetative tissues. Thus, only some members of bryophytes, pteridophytes and angiosperms are considered desiccation tolerant plants.